Moree, R. Washington State University, Pullman, Washington. **Heterozygosis and elimination rate of a heterozygously detrimental lethal of D. melanogaster.**

The viability effects of the amount and distribution of general heterozygosity on the carriers of the heterozygously detrimental Dr mutant (DIS 45:71-72) provide a basis for studying the behavior of Dr/+ in four genetically different types of populations. These types are: 1) low heterozygosity in both the linked and unlinked backgrounds of Dr/+; 2) high heterozygosity in the unlinked background only; 3) high heterozygosity in the linked background only; and 4) high heterozygosity in both the linked and unlinked backgrounds. Each of the four types of populations was started with Dr/+ flies only and was run in triplicate in Bennet type cages; adult samples were withdrawn, counted, and returned, at two-week intervals. Type-1 populations had the initial structure $S/S;S/S;S/S^o$, where S indicates a Canton-S chromosome and S^o a Canton-S chromosome carrying Dr. Type-2 populations were initially $X/S;W/S;S/S^o$, where W indicates a Wawawai chromosome and X a chromosome containing Wawawai, Canton-S and other segments in about the ratio of 1:1:4. Type-3 populations were initially $S/S;S/S;S/W^o$, W^o being a Wawawai chromosome carrying Dr. Type-4 populations were initially $S/W;S/W;S/W^o$. In types 3 and 4 the phenotypic +/+ competitors of Dr/+ would, initially, have a lower third chromosome heterozygosity than the latter, although with time and recombination the third chromosome heterozygosities of the two genetic types would tend toward equality and might also tend to be diminished, although this last would be, I think, contrary to general expectation. And to the extent that fitnesses depend on heterozygosity, they would be accordingly affected. The pooled and rounded results are summarized in the following table, with counting times indicated at two-week intervals (t), elimination percentages of Dr/+ flies in population types 1-4, theoretical elimination percentages for Dr/+ (T) and, in the lower part of the table, estimates of the average adult population size per cage, given in hundreds.

t)	0	1	2	3	4	5	6	7	8	10	12	14	16
1)	100	58	37	19	12	8	4	2	0.8	0.4	0.08	0.02	-
2)	100	64	46	34	20	12	6	4	2.0	0.7	0.30	0.02	-
3)	100	65	54	44	31	21	15	10	7.0	2.0	1.00	0.50	0.1
4)	100	67	58	45	33	23	18	14	10.0	5.0	3.00	2.00	0.8
T)	100	67	50	40	33	29	25	22	20.0	16.7	14.29	12.50	11.1

1)	10	15	14	9	12	14	15	15	11	18	28	28	33
2)	10	33	34	49	59	62	62	69	63	66	65	54	-
3)	10	25	33	42	45	46	58	56	58	62	69	62	66
4)	10	32	43	39	49	53	53	43	41	46	52	66	67

In Type-1 populations the frequency of Dr/+ decreased rapidly since Dr is heterozygously deleterious. Elimination, which was complete by the 28th week, occurred more rapidly than expected on the basis of the previously determined viability effect of Dr (DIS 45:71-72); evidently Dr is deleterious for other fitness components as well as for viability.

In Type-2 populations the elimination rate was significantly lower than in Type-1; but somewhat surprisingly the extinction point was the same as for the Type-1 populations. One might almost suppose that high initial background heterozygosity was rapidly lowered by continuous recombination.

There was some overlapping of the elimination rates for the individual cages of the Type-3 and Type-4 populations; the data of two Type-3 and two Type-4 populations appear at present to be inextricable. The pooled results show a slight but consistently lower elimination rate for Type-4 populations; but ultimately this difference may prove to be statistically not significant. However, in Type-3 populations the elimination rate was significantly lower than in populations of Type-2. In fact, the Type-3 Dr/+ flies were temporarily superior in fitness as is shown by their frequencies being higher than the theoretical values from about the 3rd to the 7th weeks (see underlines, table). By the 36th week there remained but an average of 1.67 Dr/+ flies per cage, at which time these cages were terminated. In Type-4 populations this temporary superiority in fitness, compared to the theoretical values, occurred from the 2nd to near the 8th week (see underlines, table). This, together with the fact that at the 40th week the pooled Dr/+ frequency in Type-4 populations was still at 0.2%, suggests a real biological difference between Type-3 and Type-4 populations despite a seeming lack of significant statistical difference. Unfortunately these last populations had to be terminated at this point; so it can not be known at present whether a low level polymorphism might have been developing.

With respect to adult population size, Types 2-4 form a group clearly in contrast with Type-1 and clearly in agreement with their greater heterozygosity. But, rather surprisingly, they do not differ especially among themselves even though their total heterozygosities do. Heterozygosity, in this respect, does not appear to be acting in any simple, additive way. (Aided by funds from the State of Washington Initiative Measure No. 171 for the Support of Biological and Medical Research.)

Benedík, J.K. J.E. Purkyně University, Brno, Czechoslovakia. Effect of disruptive and directional selection.

A possibility was tested of the increase of genetic variance in long term directionally selected populations of D. melanogaster by means of disruptive selection. This attempt was made to introduce a new genetic material into highly inbred selected lines in order to make possible a new selection progress.

After 54 generations of directional selection on sternopleural bristle number in two natural populations of D. melanogaster (Su - Suchumi and Kr - Krnov) in which selection limit seemed to be achieved, three generations of disruptive selection with 50 per cent gene flow (see Millicent and Thoday, 1961) were used and the comparison of disruptive and directionally selected lines as for the changes in the population mean and variance was made. The results are given in the Table. No significant difference (except one) occurred in variance during three generations between four lines of disruptive selection (A - B) and the corresponding line selected directionally. This conclusion doesn't correspond with the results of Gibson and Thoday (1962) and others, in the experiments in which disruptive selection leads to the increase of variance.

Test of differences in variance between disruptive and directional selection

Tested lines	First generation	Second generation	Third generation
Su A+/Su+	1.648^{x}	0.845	1.283
Su B+/Su+	1.222	0.936	1.128
Su C+/Su+	1.248	0.768	1.727
Su D+/Su+	0.960	0.730	1.159
Su A-/Su-	1.177	0.889	0.959
Su B-/Su-	0.921	1.023	0.959
Su C-/Su-	0.883	1.305	0.743
Su D-/Su-	0.023	1.102	0.753
Kr A+/Kr+	0.999	1.031	1.427
Kr B+/Kr+	0.778	0.872	1.041
Kr C+/Kr+	0.699	0.846	1.026
Kr D+/Kr+	0.760	0.861	1.241
Kr A-/Kr-	1.083	1.004	0.821
Kr B-/Kr-	0.938	0.893	0.851
Kr C-/Kr-	0.819	1.091	0.746
Kr D-/Kr-	0.734	0.986	0.873

x - $P < 0.10$

As for the differences between disruptive and directional selection in the population mean, the number of significant differences gradually increased with the increasing number of generations. These differences were caused by relatively lower selection intensity in the disruptive selection so that the disruptive selection operated in the same way as the relaxation of selection.

According to these results disruptive selection is not suitable either for the increasing of genetic variance nor lengthening of reaction in directionally selected populations.

References: Millicent, E. and J.M. Thoday 1961 Hered. 16:199-217; Gibson, J.B. and J.M. Thoday 1962 Hered. 17:1-26.